REMARKS

The Office Action mailed September 28, 200 has been reviewed and carefully considered. Claims 3, 4, 9 and 11 remain pending in this application, with claim 3 and 4 being the only independent claim.

Claims 3 and 4 have been amended.

Reconsideration of the above-identified application, as amended, and in view of the following remarks is respectfully requested.

In the outstanding Office Action the Examiner rejected claims 3, 4, 9 and 11 as being anticipated under 35 U.S.C. §102(b) over U.S. Patent No. Gries et al (US 6,633,595) or Zanger et al (US 6,317,449) or Pelouch et al (US 5,383,198).

It is respectfully reiterated that none of the references disclose a method for producing laser radiation which utilizes determining a preferred beam path direction of a frequency conversion crystal by arranging the crystal in two possible directions for frequency conversion, the two possible directions being related by 180 degrees and then amplifying the radiation of an optical pumping source by using an optical cavity having at least one frequency conversion crystal disposed such that the crystal is passed by the radiation only in the predetermined beam path direction. Furthermore, neither reference disclose a frequency-converted laser apparatus comprising an optical pumping source for producing optical pumping radiation and a unidirectional ring cavity which comprises a frequency conversion crystal, a prism and mirror arrangement, wherein the frequency conversion crystal is positioned in a predetermined direction such that the radiation produced by the optical pumping source enters in a direction such that the crystal is passed by radiation only in one selected beam path direction.

The Zanger reference discloses a method and to a device for resonance enhancement for tunable frequency conversion of continuous laser radiation, with a resonator of mirrors and at least one refractive element. The invention permits frequency conversion of continuous laser radiation. The invention provides an improved tunability which will be assured over the greatest possible wavelength range with regard to the incident wavelengths. A tuning of resonator length

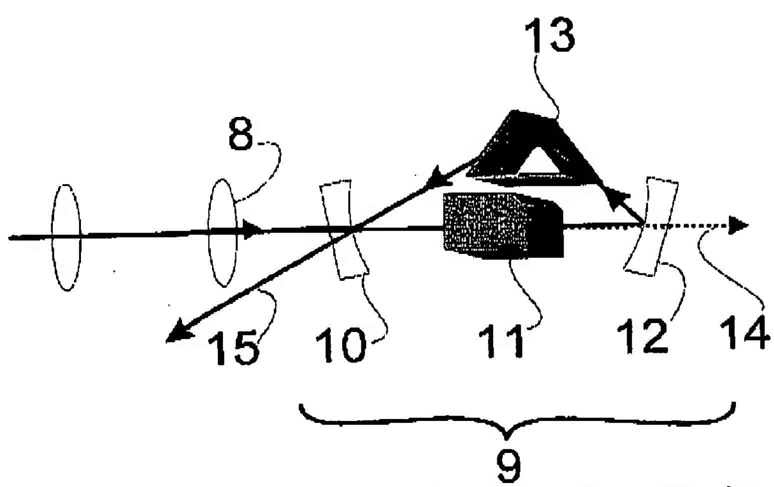
is performed by translation of at least one refractive element P. The resonator is formed from a first mirror M1, a second mirror M2, and of a refractive element P designed in trapezoidal shape, which performs the function of a prism. There is no need or disclosure for "determining a preferred beam path direction of a frequency conversion crystal by arranging the crystal in two possible directions for frequency conversion, the two possible directions being related by 180 degrees", which is an essential element of the present invention.

Furthermore, Gries discloses an arrangement for the resonant frequency doubling of multimode laser radiation with resonators, which includes mirrors and an optically nonlinear material. The arrangement ensures a dispersion-free tuning of the length of a passive resonator, and enables the frequency doubling of a multimode laser, which is resonant simultaneously for all modes of the laser radiation, and which is achieved by pairs of mutually oppositely disposed movable elements of an optically transparent material, such as prisms (P1, P2). The prisms are brought into the beam path of the resonator (R), formed from mirrors (M1 to M4) and optically nonlinear material (BBO). The prisms are movable elements (P1, P2) which are connected to adjusting elements such as piezoactuators, so that the optical length of the resonator (R) can be tuned and compensation for dispersion attained. There is no disclosure or need for "determining a preferred beam path direction of a frequency conversion crystal by arranging the crystal in two possible directions for frequency conversion, the two possible directions being related by 180 degrees", which is an essential element of the present invention.

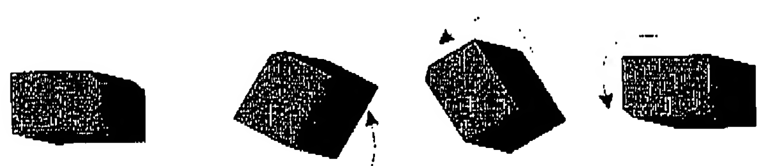
Finally, Pelouch discloses a self-mode-locked ring cavity laser incorporating a laser crystal such as Ti:Sapphire, which includes an external cavity for producing self-starting of mode-locked operation. The external cavity receives a portion of one of the continuous wave beams from the ring cavity modulates it, and retroreflects it back to the ring cavity to initiate mode-locked unidirectional operation. The unidirectional mode-locked operation is in a direction which decouples the external cavity. The establishment of mode locking thus forces unidirectional operation of the Ti:sapphire laser in, for example, the CCW direction. Thus, the unidirectional path in Pelouch is entirely different than applicants claim element which calls for "determining a preferred beam path direction of a frequency conversion crystal by arranging the

crystal in two possible directions for frequency conversion, the two possible directions being related by 180 degrees".

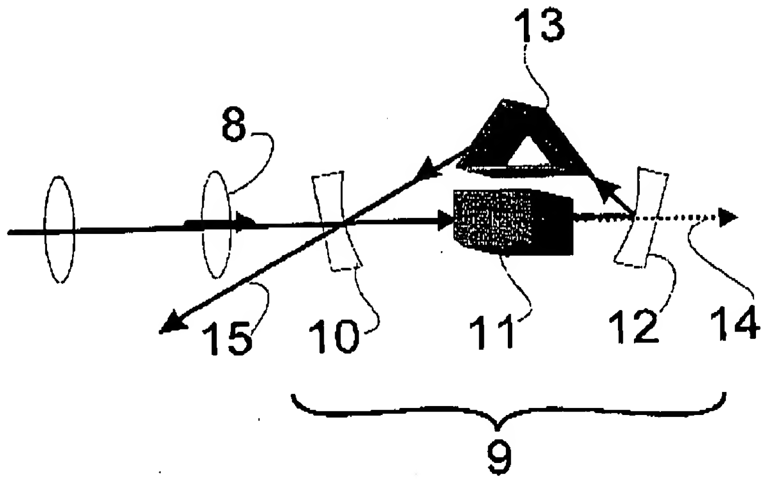
In contrast to the references cited, the predetermination of a preferred beam path direction of a frequency conversion crystal inside a build up ring cavity allows for a build up cavity to enhance the power of a cw laser beam including an optical elements (10,12 and 13) to circulate laser light and an nonlinear frequency conversion crystal to convert the circulating fundamental power into another frequency, usually but not limited to the second harmonic of the fundamental of the beam. To indicate the orientation of the nonlinear crystal 11, there is a wedge on one edge of the crystal. The entrance beam is imaged into the ring cavity with the lens 8 and circulates inside the cavity 9 when the optical length inside the cavity is a multiple integer of the wavelength of the laser beam.



As shown above, a typical set up of a ring cavity with mirrors 10 and 12, prism 13 and frequency converting crystal 11 is shown.



Here, the rotation of the crystal in 360° steps around an axis vertical on the paper plane: 180° rotation from left to right as indicated by the wedge.



In the figure above, the crystal shown before is rotated by 180° around an axis vertical to the paper plane.

Between the two depicted ring cavities, there is one preferred direction of the nonlinear crystal which is being predetermined. In one direction, photo refraction occurs. A charge carrier grating is build up and the in the ring cavity circulating fundamental beam is reflected in exactly the backward direction. This causes depletion of the circulating fundamental beam and with it a decrease of the generated beam 14. If the crystal is turned back again by 180° this effect vanishes and becomes negligible. Thus, without determination the crystal direction, it is not possible to generate reliable operation of frequency conversion to generate the laser beam 14.
This is being accomplished by the present invention and is not disclosed in any of the three cited references. "A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). The presently amended independent claims 3 and 4 are not set forth in any references and, neither are dependent claims 9 and 11.

Thus, it is respectfully submitted that the rejections under 35 USC 102 should be withdrawn.

The Examiner also rejected claims 6, 7 and 10 under 35 USC 103(a) as being obvious over the same references discussed above, Gries, Zanger or Pelouch. Claims 6, 7 and 10 depend

on claim 4 which was amended and in the above discussion; the claims were distinguished from the cited references of Gries, Zanger or Pelouch. The dependent claims should be patentable because the independent claim is now patentable.

For the foregoing reasons applicants submit that independent claims 3 and 4 are patentable over the art of record. Claims 6, 7 and 10 depend from independent claim 4 and thus are patentable for the same reasons that claim 3 and 4 are patentable. Applicants submit that the application is now in condition for allowance and passage to issuance is requested.

If any additional fees or charges are required at this time in connection with the application, authorization is hereby given to charge our Patent and Trademark Office Deposit Account No. 14-1263.

Respectfully submitted,

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